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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,655	06/27/2003	Christopher L. Coleman	10030279-1	2630

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EXAMINER	
CHANG, AUDREY Y	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/607,655	COLEMAN, CHRISTOPHER L.	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Appeal Brief filed on June 28, 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 7-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 7-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office Action is in response to applicant's appeal brief filed on June 28, 2005, which has been entered into the file.

Response to Arguments

1. In view of the **appeal brief** filed on **June 28, 2005**, PROSECUTION IS HEREBY REOPENED. New grounds of rejections are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

2. Claims 1-5, and 7-24 remain pending in this application.

3. The rejections to claims 16-24 under 35 USC 112, first paragraph, set forth in the previous Office Action are withdrawn in response to the arguments stated in the appeal brief.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. **Claims 16-24 are rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term "focus" in claims 16-24 is used by the claim to mean "the percentage of light incident on the diffractive optical element that is properly scattered by the element (i.e. transmitted through the element and scattered in a desired direction", (please see the specification page 4 lines 4-9)), while the accepted meaning is "*converging* the transmitted light to a *specific* focal point" The term is *indefinite* because the specification does not clearly redefine the term. The specification describes the prior art diffractive optical element (200) is capable of "focusing" transmitted light in the art-accepted meaning for the term "focus", (it is apparent the prior art diffractive optical element *does not* teach that the term "focus" merely means to *scatter* light to a desired direction, rather they intended the term for "*converging* the light to a point"). The specification therefore **fails** to provide a *consistent description* for the term "focus" used through out the specification. Scattering the incident and transmitted light to a *desired direction* is *completely different* from the accepted means of the term "focus" in the art. An incident and transmitted light can be *transmitted, scattered, diffused, diffracted, refracted* to a desired direction WITHOUT the optical action of "*converging* the transmitted light to a focal point", which is a necessary condition for the term "focus" as accepted in the art. The claims are therefore confusing and indefinite. The claims are being examined under the broadest interpretation, namely, the term "focus" is read as "transmitted light are scattered in a desired direction.

Claims 17-24 inherit the rejection from their respective based claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 7-8, 9, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by the patent issued to Unno (PN. 5,995,285).

Unno teaches a *diffractive optical element*, (Figure 4), that is comprised of a *transparent substrate*, (130) having a *surface relief pattern* formed on a first side thereof and an *anti-reflection coating* (132) formed on the surface relief pattern by a *sputtering* deposition process with the deposition material (131) deposited from above at *right angle onto* the surface of the substrate, (please see Figure 4, column 2, lines 52-65). The right angle deposition direction means that the deposition material used to deposit the anti-reflection coating is deposited by a *directional deposition technique*, (i.e. deposition particle beam is directed at a particular direction that is *perpendicular* to the surface of the surface pattern). The anti-reflective coating (132) is deposited to have the same dimension as the surface relief pattern form on the substrate.

With regard to claims 7 and 8, Unno teaches that the surface relief pattern formed on the substrate includes a first set of surfaces that are each substantially parallel to a longitudinal plane of the substrate and a second set of surfaces that are each substantially perpendicular to the longitudinal plane, (please see

Figure 4, each step of the surface relief patter has a parallel surface and a perpendicular surface with respect to the surface of the substrate). Each surface of the first set of surfaces is covered by the anti-reflection coating and each surface of the second set of the surfaces is free from the anti-reflection coating.

The method for forming this diffractive optical element as recited in claim 9 is met by the disclosure of this reference.

With regard to claim 15, Unno teaches that the anti-reflection coating is deposited by *sputtering* deposition process, (please see Figure 4 and column 2, lines 52-65).

This reference has therefore anticipated the claims.

8. Claims 1-4, and 7-8 are rejected under 35 U.S.C. 102(e) as being anticipated by the patent issued to Unno et al (PN. 6,641,985).

Unno et al teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figures 3 and 4), comprises a *quartz substrate*, (21) having *surface relief pattern* formed on a first side of the substrate, and an *anti-reflection coating* (layer 22, in Figure 3 or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* or *width dimension* as the surface relief pattern, (please see column 5, lines 20-55).

This reference has met all the limitations of the claims. It does not teach explicitly that the anti-reflection coating formed on the surface relief pattern is *by a directional deposition technique*. However, the *product-by-process limitation* is not given any patentable weight since the process "directional deposition technique" is a commonly known film deposition method in the art that does not differentiate the product, i.e. the deposited anti-reflection coating on the surface of relief pattern, from the prior art diffractive optical element having the same structure.

With regard to claim 2, the quartz substrate (SiO_2) is a semiconductor substrate.

With regard to claim 3, the diffractive optical element forms a transmission grating.

With regard to claim 4, Unno et al teaches that the anti-reflective coating comprises *dielectric* layer materials such as metal oxide, (please see column 5 and line 43).

With regard to claims 7-8, Unno et al teaches that the surface relief pattern comprises a *first set of surfaces* that are *parallel* to the longitudinal surface of the substrate and are coated with the anti-reflective coating and comprises a *second set of surfaces* that are *perpendicular* to the longitudinal surface of the substrate that are not coated with or *free from* the anti-reflective coating, (please see Figures 3 and 4).

This reference has therefore anticipated the claims.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al (6,641,985) and in view of the patent issued to Tran et al (PN. 5,853,960).

The diffractive optical element taught by **Unno** et al as described for claim 1 above has met all the limitations of the claims. Unno et al teaches that the anti-reflective coating may be formed by dielectric layer material such as metal oxides, however it does not teach explicitly that it also includes the materials claimed, (i.e. silicon dioxide and silicon nitride etc.). But these materials are extremely well known dielectric materials for making anti-reflective coating, as demonstrated by the teachings of **Tran** et al, (please see column 9, lines 7-19). It would then have been obvious to one skilled in the art to apply

the teachings of **Tran** et al to modify the anti-reflective coating of **Unno** et al to utilize dielectric materials such as silicon dioxide or silicon nitride for the benefit of making the anti-reflective coating with desired optical characteristics. It further has been held that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

11. Claims 9-11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al (PN. 6,641, 985) in view of the patent issued to Unno (PN. 5, 995,285).

Unno et al ('985) teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figures 3 and 4), comprises a *quartz substrate*, (21) having *surface relief pattern* formed on a first side of the substrate, and *an anti-reflection coating* (layer 22, in Figure 3 or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* as the surface relief pattern, (please see column 5, lines 20-55).

This reference has met all the limitations of the claims. Unno et al ('985) teaches that the anti-reflective coating may be **deposited** directly on the substrate or **deposited** on the underlying film (12). However Unno et al does not teach explicitly that the anti-reflective coating is *deposited directionally* via the deposition process such as sputtering. **Unno** et al *does teach* explicitly that the underlying layer film (12) that is dielectric in nature can be deposited on the substrate using *directionally selective deposition* process via *sputtering* system, (please see Figure 2 and column 4, lines 27-37, and 55-64). **Unno ('285)** in the same field of endeavor also teaches it is known in the art to deposit the antireflective coating on the surface relief pattern of a diffractive optical element by using *directional deposition technique*, wherein the deposition material (131) are deposited from above *at right angle* (i.e. with a particular direction or being directional) with respect to the surface of the surface relief patter, (please see column 4, lines 52-65). It would then have been obvious to one skilled in the art to apply the explicitly teachings of

deposition process and system disclosed by Unno ('285) and Unno et al ('985) to make the antireflective coating of Unno ('985) also deposited by directional deposition technique for the benefit of making the deposition with controlled direction to avoid the antireflective coating being deposited at places that are not intended for the deposition.

With regard to claim 10, Unno et al ('985) teaches that the quartz substrate (SiO_2) is a semiconductor substrate.

With regard to claim 11, Unno et al ('985) teaches that the anti-reflective coating comprises dielectric layer materials such as metal oxide, (please see column 5 and line 43).

With regard to claim 15, Unno et al ('985) teaches the deposition process using a sputtering system as disclosed in Figure 2. Unno ('285) teaches that the deposition is carried out by sputtering process with a directional deposition technique, (please see column 3, lines 60-65).

12. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al ('985) and Unno ('285) as applied to claim 9 above, and further in view of the patent issued to Tran et al.

The *diffractive optical element* taught by **Unno** et al ('985) as described for claim 9 above has met all the limitations of the claims. Unno et al teaches that the anti-reflective coating may be formed by dielectric layer material such as metal oxides, however it does not teach explicitly that it includes the materials claimed, (i.e. silicon dioxide and silicon nitride etc. in claim 12). But these materials are extremely well known dielectric materials for making anti-reflective coating, as demonstrated by the teachings of **Tran** et al, (please see column 9, lines 7-19). It would then have been obvious to one skilled in the art to apply the teachings of **Tran** et al to modify the anti-reflective coating of **Unno** et al ('985) to utilize dielectric materials such as silicon dioxide or silicon nitride for the benefit of making the anti-reflective coating with desired optical characteristics. It further has been held that it is within the general

skill of a worker in the art to select a known material on the basis of its suitability for the intended used as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regard to claims 13-14, Unno et al ('985) in combination with the teachings of Unno ('285) teaches conventional film deposition systems, such sputtering system and vacuum deposition system can be used to deposit the film, (please see column 4, lines 27-32). However it does not teach explicitly that the anti-reflective coating may also be deposited by *electron beam evaporation process*. But electron beam evaporation process is an *equally well known* coating process for making anti-reflective coating as taught by **Tran et al** (please see column 9, lines 7-19). It would then have been obvious to one skilled in the art to apply the teachings of Tran et al to use the electron beam evaporation process as an alternative method for forming the anti-reflective coating for the benefit of using alternative yet well-known process to form the coating.

13. Claims 16-20, and newly added claims 21-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno et al (PN. 6,641,985) in view of Kato et al (PN. 6,476,968).

Unno et al teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figures 3 and 4), comprises a *quartz substrate*, (21) having *surface relief pattern* formed on a first side of the substrate, and an *anti-reflection coating* (layer 22, in Figure 3 or multilayer 23-24 in Figure 4), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* or *width dimension* as the surface relief pattern, (please see column 5, lines 20-55).

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the substrate having the diffracting features is configured to *focus* infrared light. The feature concerning the "*focus*" is rejected under 35 USC 112, second paragraph, for the reasons stated

above. This feature is examined with the broadest interpretation that the diffractive feature is configured to *scatter* infrared light in a desired direction. Unno et al teach **explicitly** about the theoretical equations for designing the diffractive feature in terms of design wavelength, namely Unno et al teach explicitly the designs of the steps height for the diffractive feature in terms of wavelength of interest, (please see equations 2-4, and column 5, lines 42-56 for the anti-reflection coating also). From these equations, one skilled in the art can easily plugging in the number for the infrared light wavelength, (i.e. greater than 700 nm), to design the diffractive optical element that is capable of diffracting infrared light. Diffraction of the transmitted light implicitly will "scatter" light in a desired direction. **Kato** et al in the same field of endeavor teaches that diffractive optical elements can be used with infrared light for a varieties of optical applications such as photographic and exposure systems, (please see column 1, lines 6-11). It would then have been obvious to one skilled in the art to take the design formula of Unno et al to design the diffractive optical element to diffract infrared light for the benefit of utilizing the diffractive optical element in infrared photographic or exposure systems.

With regard to claim 17, the quartz substrate (SiO_2) is a semiconductor substrate.

With regard to claim 18, Unno et al teaches that the anti-reflective coating comprises *dielectric* layer materials such as metal oxide, (please see column 5 and line 43).

With regard to claim 19, Unno et al teaches that the anti-reflective coating may be **deposited** directly on the substrate or **deposited** on the underlying film (12). However Unno et al does not teach explicitly that the anti-reflective coating is *deposited directionally* via the deposition process such as sputtering. **Unno** et al *does teach* explicitly that the underlying layer film (12) that is dielectric in nature can be deposited on the substrate using *directionally selective deposition* process via *sputtering* system, (please see Figure 2 and column 4, lines 27-37, and 55-64). It would then have been obvious to one skilled in the art to apply the explicitly teachings of deposition process and system disclosed by Unno et al to also carry out the deposition of the antireflective coating for the benefit of using the same and

conventional arrangement to form the coating to save the manufacturing cost. **Furthermore**, the *product-by-process limitation* concerning the deposition *method* is not given any patentable weight pre se, since it does not differentiate the final product, namely the anti-reflective coating being deposited on the diffractive optical element of the instant application from the prior art.

With regard to claim 20, Unno et al teaches that the surface relief pattern comprises a *first set of surfaces* that are *parallel* to the longitudinal surface of the substrate and are coated with the anti-reflective coating and comprises a *second set of surfaces* that are *perpendicular* to the longitudinal surface of the substrate that are not coated with or *free from* the anti-reflective coating, (please see Figures 3 and 4).

With regard to newly added claims 21-22, Unno et al teaches explicitly that the optical thickness of the antireflective coating is a multiple of a quarter of a wavelength of interest, (please see column 5, lines 42-56), this means that for infrared light, which has a wavelength greater than 700 nm, one quarter of it is greater than 170 nm. It would have been obvious to one skilled in the art to make the antireflective coating has an optical thickness greater than 170 nm in order for it to be workable in the infrared light for the benefit of allowing the diffractive optical element applicable in optical system using infrared light.

With regard to newly added claim 24, as shown in Figure 3, Unno et al teaches that the diffractive optical element has evenly spaced grooves.

14. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Unno et al (PN. 6,641,985) and Kato et al as applied to claim 16 above, and further in view of the patent issued to Knapp et al (PN. 6,077,569).

The diffractive optical element taught by **Unno** et al in combination with the teachings of **Kato** et al as described for claim 16 above have met all the limitations of the claims with the exception that these references do not teach explicitly that the antireflective coating comprises titanium oxide. However titanium oxide is one of the most well know dielectric materials for making antireflective coating as

shown by the teachings of **Knapp** et al, (please see column 1, lines 34 to 67). It would then have been obvious to one skilled in the art to use titanium oxide as an alternative choice for making the antireflective coating for the benefit of its suitability and its higher refractive index that requires less physical thickness of the layer to be used which then saves the cost of making the layer.

15. **Claims 16 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Unno (PN. 5,995,285) in view of the patent issued to Kato et al (PN. 6,476,968).**

Unno teaches a *diffractive optical element* and a *method* for making it, wherein the diffractive optical element, (please see Figure 4), comprises a *transparent substrate*, (130) having *surface relief pattern* formed on a first side of the substrate, and an *anti-reflection coating* (132), formed on the surface relief pattern wherein the anti-reflective coating has substantially the *same dimension* or *width dimension* as the surface relief pattern, (please see Figure 4). **With regard to claim 19**, Unno teaches that the *anti-reflection coating* (132) is formed by a *sputtering* deposition process with the deposition material (131) deposited from above at *right angle onto* the surface of the substrate, (please see Figure 4, column 2, lines 52-65). The right angle deposition direction means that the deposition material used to deposit the anti-reflection coating is deposited by a *directional deposition technique*, (i.e. deposition particle beam is directed at a particular direction that is *perpendicular* to the surface of the surface pattern). The anti-reflective coating (132) is deposited to have the same dimension as the surface relief pattern form on the substrate.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the substrate having the diffracting features is configured to *focus* infrared light. The feature concerning the "focus" is rejected under 35 USC 112, *second paragraph*, for the reasons stated above. This feature is examined with the broadest interpretation that the diffractive feature is configured to *scatter* infrared light in a desired direction. Unno **does** teach **explicitly** the theoretical equations for

designing the diffractive feature in terms of design wavelength, namely Unno teaches explicitly about the steps height for the diffractive feature in terms of wavelength of interest, (please see columns 3-10). From these equations, one skilled in the art can easily plugging in the number for the infrared light wavelength, (i.e. greater than 700 nm), to design the diffractive optical element that is capable of diffracting infrared light. Diffraction of the transmitted light implicitly will "scatter" light in a desired direction. **Kato** et al in the same field of endeavor also teaches a diffractive optical elements can be used with infrared light for a varieties of optical applications such as photographic and exposure systems, (please see column 1, lines 6-11). It would then have been obvious to one skilled in the art to take the design formula of Unno design the diffractive optical element to diffract infrared light for the benefit of utilizing the diffractive optical element in infrared photographic or exposure systems.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Audrey Y. Chang, Ph.D.
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A. Chang, Ph.D.

DREW A. DUNN
SUPERVISORY PATENT EXAMINER